The Effect of Alcohol Consumption History on Sensitivity and Acute Functional Tolerance to the Ataxic Effects of Alcohol in C57BL/6J Mice

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Binge alcohol drinking may increase the rate of development of acute functional tolerance (AFT; within session tolerance) and decrease initial sensitivity to alcohol, which in turn may increase the binge drinking behavior. The focus of this study is to determine the effects of the alcohol pre-exposure on two major responses to alcohol, sensitivity and tolerance. Sixty male C57BL/6J mice in the range of 60 to 80 days old were placed in one of the five groups varying their duration of the alcohol pre-exposure. Mice were tested for ataxic sensitivity and tolerance following 0, 1, 4, 8, or 15 days of binge alcohol consumption. The pre-exposure was conducted in the limited access drinking paradigm over the course of the dark cycle for fifteen consecutive days. The static dowel task, which requires mice to balance on an elevated wooden dowel, was utilized to determine the sensitivity, recovery length, and AFT capacity to alcohol-induced ataxia. AFT was quantified by comparing the blood alcohol concentration (BAC) at loss of balance to the BAC at recovery. Although it appeared that 4 and 15 days of repeated binge alcohol drinking reduced sensitivity to alcohol, there were no main effect of the group ($p > 0.05$). Analysis of the recovery of balance was significant ($p < 0.05$), with post-hoc tests indicating that mice with 4, 8, and 15 days of repeated binge alcohol drinking recovering the ability to balance on the static dowel earlier than the 0 group. However, the analysis of AFT was not significant, indicating that prior binge alcohol drinking, regardless of duration, did not alter development of within session tolerance. Future studies evaluating AFT using these physiological markers are needed to validate the contradictory findings and advance the scientific knowledge of the relationship between binge drinking and AFT.

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